Factors influencing Chinese consumer behavior when buying innovative food products

Faktory ovlivňující chování čínských spotřebitelů při nákupu inovovaných potravin

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Abstract: This study conceptualizes a model of Chinese consumers' purchase decision for the GM foods by empirically testing the interrelationship among the GM food purchase decision determinants with a multi-attribute model. The purpose of this study is to explore what underlying factors affect the Chinese consumer choice behavior for the GM food. A clear understanding of the determinants of consumers' GM food choice may enable policy makers and marketers to build effective policies and marketing strategies and to establish market position of the GM food. The results show that consumers' perceived concern toward the subjects such as limited information availability, environmental hazard as well as ethical issues of the GM food are strong indicators of consumers' GM food purchase decision.

Key words: consumer behavior, genetically modified (GM) food, China, multi-attribute model and structural equation modeling

Abstrakt: Studie nabízí koncept modelu rozhodování čínského spotřebitele pro nákup geneticky modifikovaných (GM) potravin formou empitického testování vzájemných relací jednotlivých determinant rozhodování pro nákup GM potravin a multi-atributivním modelu. Cílem studie je zjištění faktorů ovlivňujících spotřebitelské rozhodování čínských spotřebitelů při nákupu těchto potravin. Pochopení determinant spotřebitelského rozhodování pro GM potraviny by umožnilo tvůrcům ekonomické politiky a tržním subjektům vytvářet efektivní nástroje politik, marketingové strategie a budovat tržní postavení GM potravin. Výsledky ukazují, že domnělé starosti zákazníků ohledně témat jako omezena dostupnost informaci, ohrožení životního prostředí stejně jako etické otázky geneticky modifikovaných potravin, jsou silným indikátorem toho, zdali se zákazníci rozhodnou koupit geneticky modifikované potraviny.

Klíčová slova: spotřebitelské chování, geneticky modifikované (GM) potraviny, Čína, multi-atributivní model a modelování strukturálních rovnic

Since the introduction of the Genetically Modified (GM) food in the global food system in the early 1990s, the consumer concern and interest in this product has evolved substantially, exhibiting varying degrees of consumer preference in different nations. GM food is an innovative product which offers new untested opportunities, but which may present potential unforeseen risks, causing consumers to have fear, uncertainty and doubt (Phillips, Corkindale 2002). Thus, the perceptual map of consumers toward this innovative product may be one of the most important determinants for their GM food purchase decision. Consumers are also concerned about the potential unexpected damage to the environment, the destruction of biological diversity, and religious and ethical problems that are associated with the GM food. Although the biotechnology for producing GM food continues to advance and new GM food is continuously being developed, stakeholders such as government, food industry and consumers are reluctant to accept this product comfortably. It is imperative to raise the attention and to trigger the discussion of feasibility of the GM food commercialization and marketing as this is one of the most significant recent innovations in the food industry, entailing considerable potential benefits to the world food supply.

In evaluating the introduction of an innovative product that has both private and public impacts,

understanding and predicting the nature of consumer responses is vital to the evaluation of the resulting costs and benefits. Good understanding of the consumer choice behavior for an innovative product also provide an insight for the proper development of product or service design, pricing strategy, distribution-channel and communication-strategy selection (Louviere 2000). In other words, strategic marketing efforts need to be made by GM food marketers, if they are to successfully develop a solid market for this innovative product. This involves determining what is the likely eventual total response to the GM food is and what are the important factors that may trigger early buyers and leaders in the consumer market to accept the GM food. Consumer acceptance is likely to determine the future development of the GM food, and determine the success or failure of products reaching the marketplace (Frewer et al. 1995). The purpose of this study is to explore what underlying factors affect consumer purchase intention for the GM foods. A clear understanding of the determinants of the consumers' GM food choice may enable policy makers and marketers to build effective policies and marketing strategies and to establish market position of GM food.

Consumers in China are chosen because of the importance of China as one of the world's largest players of the world food market. China is an untested market for the GM food marketing as its consumers have a limited knowledge and exposure to the GM food. A survey study in China states that the majority of the respondents (60%) were neutral or unwilling to consume the GM food due to the lack of the available information on the GM food in China (Ho, Vermeer 2004). The limited hitherto experience of Chinese consumers with the GM food and the highly salient nature of the subject (i.e. the criticism and anxieties for the GM food created by the media and consumer/environmental groups) may lead to the attitude formation and decision making of Chinese consumers to be complex and closely related to personal values (Bredahl et al. 1998). In this study, we propose to conceptualize a model of Chinese consumers' purchase decision for the GM foods and support its logical ramification; to test empirically the model using a path analytic technique; and to provide marketing and policy implications based on these findings.

RESEARCH MODEL AND HYPOTHESES

Model development and framework

In this study, a multi-attribute model will be applied; several Likert scale questions will be asked to the individuals to see whether they agreed or disagreed with several statements regarding their attitude and perception of risk in consuming the GM food products. Several studies show that the consumer decision-making process is a multistage problem-solving operation. The multi-attribute model, which originated from the Fishbein and Ajzen study (1975), has been well recognized as an established framework for explaining the attitude, intention, and choice. This model was accepted for its widespread use in consumer research and for its diagnostic value in explicating attitudes (Mittal 1988; Sheppard et al. 1988; Agarwal, Malhotra 2005; Peterson, Wilson 1992).

Figure 1 illustrates the structural model of consumers' choice behavior for the GM food. The conceptual model of this study is developed specifically to address the critical role of the consumers' cognitive and individual characteristics constructs in determining their purchase intention of the GM food. Our research model assembles three constructs: *Perceived Benefits, Perceived Concerns* and *Socio-Economic Status (SES)*, and assesses their comparative and interactive effects on consumers' purchase intention for the GM food.

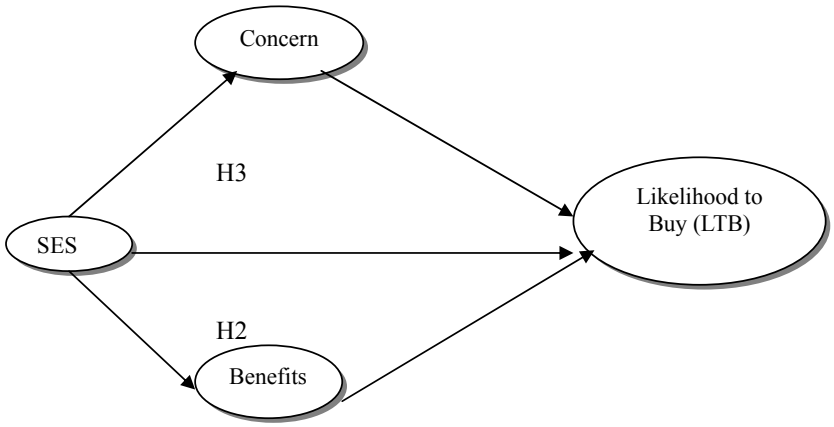

Figure 1. Structural model of the consumer GM choice behavior

Perceived Concerns is a cognitive construct that represents the consumers' mindset and determines the consumers' decision making and actions. *Perceived Concerns* can be defined as a summarized evaluative judgment, based on cognitive beliefs and their evaluative aspect, ranging from acceptability to attraction (Agarwal, Malhotra, 2005). *Perceived Benefits* are consumers' overall assessment of the utility of a product based on the perceptions of what is received and what is given, and the value represents a tradeoff of the salient give and gets components (Zeithaml 1988). *Socio-Economic Construct* is included in order to measure the effects of the individual difference on consumers' purchase decision and to enhance the predictability of the behavioral intentions of consumers for the GM food. A number of studies show that socio-economic variables are important determinants affecting the consumers' attitude toward the GM food (Hamstra, Mink 1996; Hoban 1996a, b; Bredahl et al. 1998; Baker, Burham 2002; Mangusson, Hursti 2002). Engel, Kollat and Blackwell's model stress the importance of individual differences on the consumer's purchase decision (Engel et al. 1995).

Structural model: the determinants of LTB GM food products

We propose to measure the Chinese consumer choice behavior with multiple dimensions as consumer perceptions toward these constructs translated into their likelihood to buy (LTB). We use the survey

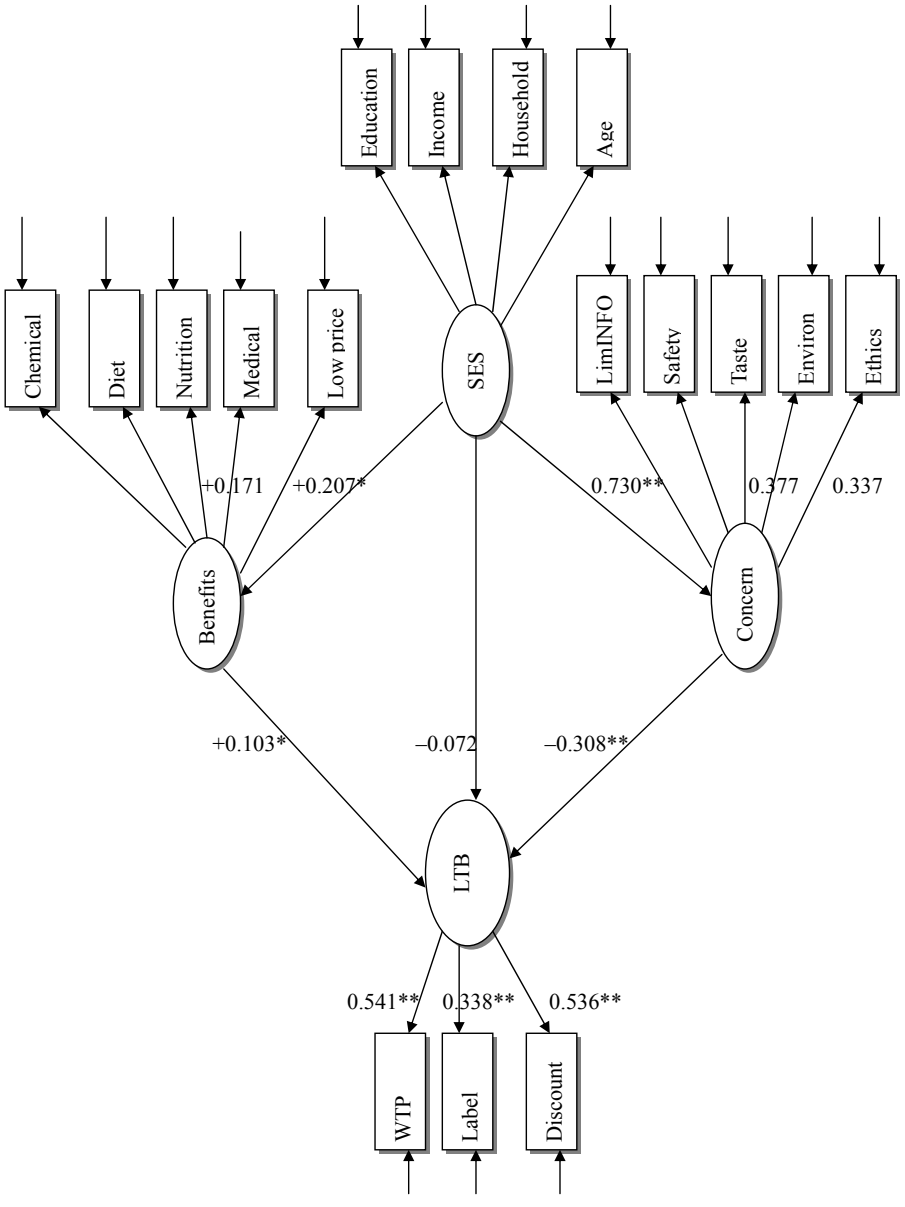

Figure 2. Structural equation model of the consumer GM LTB

method to investigate the percentage of consumers who express a preference, favorable attitude, purchase intention of the GM food products. The conceptual model of this study is developed specifically to address the critical role of three major attributes in the consumer GM purchase decision. Our research model assembles three constructs: *Perceived Concerns, Perceived Benefits* and *Socio-Economic Status,* and assesses their comparative and interactive effects on consumers' choice behavior for the GM food (Figure 1).

The GM LTB model in our study includes three attributes which consists of two attitude constructs and a SES construct. *Perceived Benefits* and *Perceived Concerns* are considered as two 'attitudinal' constructs which are used in the consumers' evaluation of the quality, safety and the performance of a GM product. The attitude construct can be defined as a summarized evaluative judgment, based on cognitive beliefs and their evaluative aspect (Agarwal, Malhotra 2003). In the following section, the relevance of the identified determinants of the proposed model is assessed and the main hypotheses are established. The relational paths among the constructs and observable variables are presented in Figure 2.

Measurement model: scale development

Each of three selected constructs is a latent variable observed only indirectly through the observable survey variables. Thus, each latent construct is modeled as a common factor underlying the associated measures (i.e. observable variables). Fourteen independent observable variables and three dependent observable variables are determined as scales and collected in the quantitative survey stage and used in the data analysis with structural equation modeling (SEM). This section describes the relevance of three determinants affecting the Chinese consumers' decision for the GM food purchase intention and presents associated research hypotheses.

In this study, *Perceived Concerns* construct refers to the consumers' attitude towards the following factors: ethical concern for the GM food; concern for environmental hazards; concern for food safety of the GM food;

Table 1. List of the selected variables[1]

Latent variables	Observed variables
Independent variables	
Perceived Concern Construct	Limited Information on GM food
	Environmental Hazards
	Ethics
	Food Safety
	Taste of GM food
Perceived Benefits Construct	Reduced Use of Chemicals in production
	Diet Products
	Nutrition Enhancement
	Medical Function
	Price advantage
Socio-Economic Status (SES) Construct	Education
	Income (Yuan)
	Household size
	Age
Dependent variable	
Likelihood To Buy (LTB) GM Food	Label Checking for GM food
	Willingness to Pay (WTP) for GM food
	Reasonable Price Discount

[1]Likert scale used in the SEM model is: 1 = lowest level and 5 = highest level. The five latent variables, consisting of three independent variables and one dependent variable, are each constructed from the corresponding groups of observed variables on the right hand side of the table

limited information and knowledge on the GM food; and the taste of the GM food. Five scales are selected (Table 1) for measuring consumers' general attitude towards the GM food. When consumers perceive the risk associated with the GM food, they are likely to reject it (Harrison 2004). Thus, the more concerned the consumers are toward the aforementioned factors, the less the are likely to purchase the GM food.

Hypothesis 1: consumers' GM purchase decision is a negative function of the *Perceived Concerns* construct.

When consumers consider purchase of a GM product, they may be conditioned to assess the alternative benefits of the GM food. Consumers are interested in considering the potential benefits associated with the GM food such as price discount, medical benefit, nutritional enhancement, diet products and the reduced chemicals in production for their purchase (Kuznesof, Ritson 1996). Consumers may increase their likelihood to purchase the GM food for these extrinsic cues of the GM benefits.

Hypothesis 2: the greater the consumers' perceived benefits of the GM food, the more they are likely to purchase it.

Individual difference factors such as socio-economic variables are important in determining the consumers' purchase decision. This construct identifies the following five variables: Gender, Education level, Age, Income and Employment Status.

Hypothesis 3: consumers' GM purchase decision is a negative function of the *socio-economic status* (SES) construct.

The likelihood to buy (LTB) construct is the dependant latent variable that is affected by the three independent constructs which are mentioned above. This construct represents three observable variables such as the GM food Willingness to Pay; the extent of the GM label check by the consumers and the GM discount level that the consumers consider to be reasonable. These three variables are found to be correlated with each other, and the LTB construct elicits such relationship effectively. For example, a respondent who prefers a higher level of the GM discount is less willing to pay for the GM food, and more likely to check the GM label on its purchase.

METHOD

Survey design and scale development

On the basis of the results of a qualitative study by the industry and academic discussion in China, a questionnaire was designed. The original survey was developed in English and translated into Chinese, pre-tested by Chinese academics and back-translated into English for the data analysis. Prior to the execution of the data collection, the survey was pre-tested both in Canada and in China at the Chinese Academy of Agricultural Science in Beijing. Important variables were identified from this pre-test and the consultation with the industry professionals and used in developing the survey questionnaire. The final survey questionnaire included questions to identify:

- Socio-economic characteristics
- Chinese consumer shopping and consumption patterns,
- General attitude toward science, health and food, awareness, and the GM food
- Self-perceived and actual level of knowledge of the GM food.

All items were measured on 5 point Likert scale with 1 = lowest level and 5 = highest level.

Survey data collection

A convenience sample of the primary food shoppers in five major cities was collected in China, including Beijing, Jinan, Tianjin, Ningbo and Shanghai. In total, 349 usable sample data were collected. Many studies used student samples for the empirical analysis and the validity and generalizability of student samples have been questioned as the student population does not represent the general population or the "real people" (Yoo et al. 2000). Ideal participants for the research examining the ifluence that affect consumer pre-purchase perceptions and purchase decision behavior are active shoppers close to the final purchase decision. This study uses a sample data that elicit the consumers who make the real purchase-decision in retailing shopping environment.

Data analysis: structural equation modeling (SEM)

To explore whether the hypothesized model fits the survey data, the Structural Equation Modeling (SEM) was employed. The SEM is a multivariate statistical modeling technique that is becoming more widely used in behavioral science, as it can model complex processes with multiple factors. The SEM is primarily developed to examine the structure of relationships between the independent latent variables and the dependent latent variables (Diamantopoulos et al. 2000).

The SEM analysis is divided into two parts: (1) structural model and (2) measurement model. The structural model deals with the relationship between the constructs (i.e. latent independent variables) and the latent dependent variable, and this is the main relationship of interest in the model (Figure 1). The measurement model deals with the relationship between the observed variables and the latent independent variables (Table 1).

Reliability analysis

The selected observed variables were initially examined and verified to have a normal distribution. The skewness and kurtosis of the statistical distribution of the original seventeen observed variables were tested in order to screen out those with non-normality. Two methods (Cronbach's reliability analysis, correlation analysis of constructs) are used to select and assess the final items which are then included in the model for hypothesis testing. Table 1 presents a summary list of the latent variables and observable variables that are included in the SEM analysis.

The confirmatory factor analysis (CFA) was carried out in order to identify and eliminate the poorly performing items and to improve the model fit. Scale means, standard deviations and Cronbach's alpha values for each purified scale are reported in Table 2. Correlation matrix of the four constructs was generated using the reliability test of the SPSS 13. Table 3 presents the statistically significant correlations among the four constructs.

The empirical model (i.e. path diagram) based on *priori hypotheses* were formulated using the AMOS 5 software and estimated using a maximum likelihood function. Overall fit statistics of the measurement model were as follows: the value of RMSEA was 0.061 and chi-square (116, 274.2) $p < 0.001$, CFI = 0.780, IFI = 0.742. These results indicate a reasonable fit of the variables in the model. This goodness of fit index pertaining to the empirical model is statistically significant.

RESULTS AND DISCUSSION

Relationship of four constructs to the GM purchase decision

A structural model approximates the relationships between the dependent latent variable (*LTB GM)* and three constructs: *Perceived Benefits, Perceived Concerns* and *Socio-Economic Status (SES)*. The SEM allows us to determine the relative contribution of four constructs and of seventeen observable variables to Chinese consumers' GM food acceptance, which is indicated by path coefficients on the path diagram (Figure 2). These coefficients (i.e. path coefficients) can be interpreted as the relative importance of each path within the model and therefore the strength of relationships between the latent variables and between each latent variable and the observed variables (Schumacker et al. 1996). Table 4 reports standardized estimates of model parameters.

The coefficient sign and size are important for the interpretation of results. As a rule of thumb,

Table 2. Reliability analysis: sample statistics for the identified constructs

Construct	Mean	Std. Deviation	Cronbach's alpha
Perceived Barriers	2.25	0.31	0.34
Perceived Benefits	4.08	0.61	0.60
Socio-Economic Status (SES)	2.41	0.45	0.43
Likelihood-to-Buy (LTB)	2.24	0.26	0.23

Table 3. Reliability analysis: correlation matrix of the constructs

Construct	Barriers	Benefits	SES	LTB
Barriers	1.00			
Benefits	0.14*	1.00		
SES	0.20**	0.15**	1.00	
LTB	0.20**	0.16**	0.18**	1.00

**significant at 1% level, *significant at 5% level

the estimated standardized SEM coefficients with a value of 0.50 can be considered a "large effect," a value of 0.30 can be considered a "medium effect," and a value of 0.10 can be considered a "small effect". The standardized SEM coefficients are similar to correlation coefficients (Hatcher 2002), and the coefficients with larger absolute sizes are associated with a higher statistical significance.

The *Perceived Concerns* and the *Perceived Benefits* constructs were estimated to be statistically significant (Table 4). The *Perceived Concerns* construct is found to be the most significant dimension for the consumers' GM purchase decision (Hypothesis 1). This indicates that as the consumers are more concerned with some negative issues associated with the GM food, they are less likely to purchase it. Consumers' GM purchase decision is positively related to the *Perceived Benefits* construct (Hypothesis 2), while it is also positively related to the SES construct (Hypothesis 3).

The relationship of the SES construct to the GM purchase decision was much weaker than that of the other two constructs. The relative size of coefficients on these constructs shows that the cognitive domains of Chinese consumers affect their GM food purchase decision making process heavily. The Chinese consumers' socio-economic status, on the other hand, plays a smaller role in forming the consumer decision making of the GM food choice. A limited knowledge and availability of information on the GM food may lead Chinese consumers to rely heavily on their personal values and attitudes towards the selected issues to determine their future purchase interest in the GM food.

MARKETING IMPLICATIONS AND CONCLUSIONS

Our results provided evidence that Chinese consumers' decision making regarding the GM food purchase

Table 4. Estimated parameters for structural equation model[1]

Latent dependant variable		**Major constructs (latent variables)**	Standardized estimates
Likelihood to Buy (LTB)	<---	Concern	–0.308***
Likelihood to Buy (LTB)	<---	Benefits	0.103*
Likelihood to Buy (LTB)	<---	SES	0.012
Observable Independent Variables		Latent Independent Variables	Standardized estimates
Limited Information on GM food	<---	Concern	0.730***
Environmental Hazards	<---	Concern	–0.337**
Ethics	<---	Concern	–0.377**
Food Safety	<---	Concern	0.033
Taste of GM food	<---	Concern	0.051
Reduced Use of Chemicals in production	<---	Benefits	0.049
Diet Products	<---	Benefits	0.032
Nutrition Enhancement	<---	Benefits	–0.025
Medical Function	<---	Benefits	0.171
Price advantage	<---	Benefits	0.207*
Education	<---	SES	9.422
Income (Yuan)	<---	SES	0.035
Household size	<---	SES	–0.002
Age	<---	SES	–0.036
Label Checking for GM food	<---	LTB	0.338***
Willingness to Pay (WTP) for GM food	<---	LTB	0.541***
Reasonable Price Discount	<---	LTB	0.536***

***$p < 0.001$ **$p < 0.01$ *$p < 0.1$

[1] Likert scale used in the SEM model is: 1 = lowest level and 5 = highest level

is a complex process, involving multifaceted factors. The results show that it is a multidimensional process that involves attitudinal and socio-economic domains of Chinese consumers. For marketers to launch a successful introduction of the various GM foods in the Chinese consumer market, it is important to understand this process.

The relationships between the selected three constructs and the consumers GM purchase decision are explored in this study. More specifically, the linkage between seventeen cognitive and socio-economic factors versus the consumer GM purchase decision is investigated through the mediating role of three dimensions using a SEM and found some important implications for the consumers GM purchase decision process. Findings of this study identify the consumers' *Perceived Concerns* associated with the GM food is reported to be the prime consideration in the Chinese consumers' GM food choice.

Consumers' concern for the lack of available information on the GM food was found to be the most important factor affecting their GM food purchase decision. The GM food is an innovative product which offers new untested opportunities, but it may present potential unforeseen risks, causing consumers to have fear, uncertainty and doubt (Phillips, Corkindale 2002). Thus, this innovative product entails the credence attribute. Credence attributes include product and service characteristics that cannot be detected under the ordinary circumstances by the buyer, either before or after the product use (Nelson 1970; Darby, Karni 1973; Brucks et al 2000). The consumers cannot predict *ex ante* the performance of the product based on the credence attributes due to *information asymmetry* (i.e. consumers are not fully informed about the product quality unlike sellers).

In situations where consumers cannot adequately assess the product quality or safety, even after experiencing the good, consumers tend to rely on trust in the information provided (e.g. product labels or certificates). In other words, when consumers are faced with alternatives, they search for risk-related information in order to help them in the decision making (Bettman 1979) and the information search serves as an input to the perceived risk assessment (Conchar et al. 2004). This suggests that the quality and extent of information provided for the innovative GM food is likely to determine the future success of the GM food commercialization in China. In other words, Chinese consumers may increase their LTB GM food if a more detailed and trustworthy information of GM food is available to the public through the media and government publications.

Traditionally, China had a positive attitude towards the GM crops. China has been spending approximately $120 million per year on the R & D of biotechnology for the GM food production (FAS 2002). China has been the only country in Asia producing a significant amount of the GM crops and is the fourth largest producer of the GM crops in the world after the US, Canada, and Argentina. However, China has recently changed its position towards the GM food as food safety has become an important issue in the country. The Chinese government has increased its attention to the food safety issues and raised its standards and regulations to manage the potential risks of the GM food. The Chinese government published the "Regulation on the Safety Administration of Agricultural GM Organisms" in 2001 (FAS 2002). This regulation requires all GM products in China that are in research, production, or processing to obtain a safety certificate from the Chinese Agricultural Ministry in order to ensure the safety regarding human consumption, animals and the environment. The increase in the regulatory framework of the GM food marketing may help establishing the public confidence and trust in the food safety of the GM food in China.

The study results show that Chinese consumers' concern regarding the potential environmental hazards of the GM food production and ethical issues related to the GM food are also the strong indicators of the consumers' GM food purchase decision. Given the limited availability of the GM food in the market which leads to the lack of understanding and experience of the GM food, the consumers' GM purchase decision is heavily rooted in their attitude. This implies that the GM food marketers and public policy makers should pay more attentions to the strength of this particular dimension. In other words, government authorities may need to improve the trustworthiness of their regulatory policy and control measures for the food safety system and environmental regulation of the GM food production, while marketers can promote innovativeness and benefits of the GM food to consumers.

The study findings also suggest that the Chinese consumers' viewpoints of GM foods have not been entrenched due to the lack of understanding, experience, and information on the GM food. This implies that despite some negative exposure of the GM food issue in the Chinese market, there may be an opportunity for the GM marketers in China if Chinese consumers can be provided with specific information (e.g. benefits related to the GM food attributes). The results show that the *Perceived Benefits* of GM food can increase the Chinese consumers' likelihood to buy GM food.

However, the firms who wish to market the GM foods in China may need to be engaged in substantial market development efforts which may require extensive marketing costs. The study results show that the price level of the GM food is an important factor for their GM purchase decision, indicating the potential sensitivity of Chinese consumers toward price of the GM food. This may require the firms to initially price their GM food at a significantly low level to attract the potential customers and may lead to a substantial financial pressure on their GM food marketing operation. Therefore, it is important for the marketers to anticipate the extent of marketing capital they require to launch the commercialization of the GM food in the Chinese market prior to market entry. The marketers may also need to explore the consumer market further in order to identify the segments that are more open to the innovative GM food and are willing to accept it. This can be important information for marketers in developing the niche marketing as the penetration strategy. The GM food market penetration strategy that ignores the roots of the consumers' attitude may lead to an ineffective market development.

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